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one dollar per gallon, which is fifteen cents' worth of oil per bushel of corn. The alcohol or whiskey was also a valuable product.

"Dr. Jackson had separated from six to eleven per cent. of pure corn oil from the eastern varieties of Zea mays, and had found most oil in the Canada and rice corn. It is contained in the gluten-cells of the grain, and is set free by decomposition of those cells by fermentation."

Three hundred and sixty-first meeting.

May 4, 1852. — MONTHLY MEETING.

The VICE-PRESIDENT, Mr. Everett, in the chair.

Professor Agassiz made an oral communication at considerable length, "On the Foundation of Symmetry throughout the Animal Kingdom."

Dr. Asa Gray communicated the characters of two new genera of plants of the order *Violaceæ*, discovered by the naturalists of the United States Exploring Expedition.

"One of these genera, of a single species, was discovered in the Feejee Islands. It belongs to the tribe *Violeæ*, having an irregular corolla, which is not unlike that of Ionidium; but the fruit is probably baccate, and the stamens are diadelphous, the posterior one being distinct from the four others. Something like this structure occurs in Corynostylis; but the corolla of that genus is very different. The genus is named in memory of the botanical draughtsman of the expedition, the late Alfred T. Agate. I trust that the name Agàtea will be deemed sufficiently different from Agathèa and Agati to be retained.

"AGATEA, Nov. Gen.

"Calyx 5-phyllus, subæqualis, basi haud productus, deciduus. Petala 5, erecta, inæqualia; postica lateralibus paullo minora; anticum majus, labelliforme, spathulatum, basi dilatatum gibboso-saccatum. Stamina 5, diadelpha, nempe; filamenta brevia, plana, antica (glandula carnosa aucta) et lateralia marginibus connata, posticum angustius distinctum: antheræ introrsum adnatæ, loculis appositis apice liberis mucronatis; connectivo in appendicem petaloideam latam producto. Ovarium globosum; placentis parietalibus 3 pluriovulatis. Stylus apice clavatus, curvatus: stigma laterale. Fructus baccatus? — Frutex sarmentosus; foliis oblongis subintegerrimis ramisque glabris; stipulis minimis caducis; racemis paniculisve axillaribus multifloris; pedicellis 2 – 3-bracteolatis infra apicem articulatis; floribus parvis viridulis.

" AGATEA VIOLARIS, sp. nov. — Feejee Islands.

" The other genus is from the Sandwich Islands, where three species were collected by the naturalists of the Expedition. It belongs to the section *Alsodineæ*, having a regular corolla. Indeed, it differs from Alsodeia, Paypayrola, *Aubl.*, and Pentaloba, *Lour.* (if these are distinct genera), chiefly in the entirely separated stamens, with narrow filaments and normal anthers, destitute of any dilated or prolonged connective, and in the unilateral stigma, which, in a flower otherwise perfectly regular, vindicates its relationship with the genuine Violeæ. The following are the characters of the genus and species.

" ISODENDRION, Nov. Gen.

" Calyx 5-phyllus, æqualis, persistens. Corolla regularis; petala 5, lineari-spathulata, longe tubuloso-conniventia, apice dilatata patentia. Stamina 5, discreta: filamenta angusta, inappendiculata, apice haud producta, antheram basifixam nudam gerentia. Ovarium uniloculare; placentis 3 parietalibus 2-ovulatis. Stylus elongatus, subclavatus, apice decurvus: stigma punctiforme laterale. Ovula collateralia, horizontalia. Capsula coriacea, 3-sperma, 3-valvis. Semina Violæ. — Arbusculæ vel frutices Sandwicenses; foliis alternis confertis; stipulis triangulatis appressis diu persistentibus; floribus axillaribus solitariis breviter pedicellatis parvis.

" ISODENDRION PYRIFOLIUM: foliis membranaceis ovalibus seu ovato-ellipticis crenato-serratis petiolatis, junioribus subtus ramulisque pubescentibus; stipulis sepalisque dorso sericeis margine scariosis; floribus pendulis. — Kaala Mountains, Oahu, Sandwich Islands.

" ISODENDRION LONGIFOLIUM: glabrum; foliis subcoriaceis obovato-lanceolatis seu cuneato-oblongis in petiolum angustatis subrepandis; sepalis ovatis stipulisque lævibus; floribus in ramos crassos brevissime pedicellatis. — Kaala Mountains, Oahu, Sandwich Islands.

" ISODENDRION LAURIFOLIUM: glabrum; foliis coriaceis oblongo-lanceolatis subrepandis basi obtusis brevissime petiolatis; sepalis lanceolatis. — With the preceding.

" The other Violaceæ of the Sandwich Islands which occur in the collection are the shrubby *Viola Chamissoniana* of Gingins, from which

V. trachelifolia of the same author is not to be distinguished, and a new species from the island of Kauai, *V. Kauensis*, which has the habit of V. sarmentosa of Oregon, and nearly the structure of the Australian V. hederacea."

Dr. Gray also communicated the characters of a new genus of *Anonaceæ* from the Feejee Islands, dedicated to Mr. Rich, the official botanist of the Exploring Expedition, viz. : —

"RICHELLA, Nov. Gen.

"Calyx subtrilobus, persistens. Corolla e petalis 6 ovatis, internis dimidio brevioribus. Torus acetabuliformis. Stamina indefinita Guatteriæ. Ovaria plura, libera, 2-ovulata: styli intus longitudinaliter stigmatosi. Ovula suturæ ventrali juxta basim inserta, adscendentia, superposita. Fructus e carpellis paucis, obovoideis, subcarnosis (siccate coriaceis), indehiscentibus, breviter stipitatis, monospermis. Semen magnum, samaroideo-nuciforme; nempe, testa coriacea marginibus alato-productis. Albumen, embryo, etc. ordinis. — Arbor Uvariæ facie.

"Richella monosperma. Ovolau, Feejee Islands. — According to Blume's arrangement of the order, this genus would stand next to Polyalthia, from which it is distinguished, as from all the others, by its winged seed."

At the suggestion of Professor Lovering, the Academy referred to the Committee on Publications an account by Mr. John Farrar, formerly Professor at Cambridge, of his observations of the solar eclipse of September 17, 1811. As these observations do not appear to have been published, the committee have made the following extracts for the Proceedings: —

"The place of observation is about five hundred feet southwest of Harvard Hall in Cambridge. Several gentlemen assisted me in observing the eclipse, and the following are the times, — *in mean solar time*, — with the instrument used in the observation in each case: —

	BEGINNING. h. m. s.	END. h. m. s.
Achromatic telescope of 2 feet focus, magnifying 20 times,	0 54 14	3 58 20
Achromatic telescope of 3 feet focus, magnifying 28 times,	0 54 20	3 58 19
Achromatic telescope of 4 feet focus, magnifying 40 times,	0 54 20	3 58 20
Gregorian reflector of 1 foot focus, magnifying 55 times,	0 54 30	3 58 20
Gregorian reflector of 4 feet focus, magnifying 260 times,	0 54 32	3 58 19

" In making use of single altitudes for the above times, it became necessary to determine the error of collimation of the astronomical quadrant, the diameter of the wires and the distance between them, which occasioned a delay that prevented the observations being seasonably forwarded to Mr. Bowditch, to be inserted in his valuable memoir on this eclipse."

Dr. O. W. Holmes presented the following communication " On the Use of Direct Light in Microscopic Researches," and exhibited at the same time a model of a new horizontal microscope.

" Three points require attention in constructing a compound microscope. First, the lenses; secondly, the illuminating apparatus; thirdly, the mechanical arrangements for insuring stability in the requisite positions, and accuracy, ease, and convenience in the necessary movements.

" The lenses have been brought to great perfection by the opticians of Europe, especially of England. In our own country, Mr. Spencer of Canastota has entered into successful competition with the most eminent among them. The extraordinary merits of his lenses have been manifested in various comparative trials, the results of some of which have been made public. In a short visit I recently made to Canastota, I carried with me the one-eighth and one-twelfth objectives belonging to the instrument made by Ross for the Lowell Institute, the use of which objectives had been kindly allowed me by the Curator. In a careful comparison of them with a one-fourth and one-eighth made by Mr. Spencer, especially on the delicate tests *Navicula Spencerii* and *Grammatophora,* the superiority of Mr. Spencer's glasses was unquestionable.

" Next in importance to the perfection of the lenses, and even more important, in Sir David Brewster's opinion, is that of the illuminating apparatus. The greater number of recently attempted improvements relate to this part of the instrument. Many of the new contrivances are expensive, complicated, and somewhat difficult of management. If the same or better results can be obtained by easier means, it would be a movement in the right direction, which is always from complexity towards simplicity.

" The common mode of examining *opaque* objects is to receive the light directly upon them as it comes from its source, or concentrate it upon them by a lens. The use of a reflector for examining is less frequently resorted to.

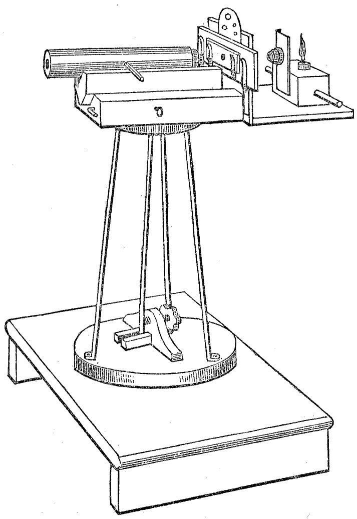
"But in examining *transparent* or *translucent* objects, which are to be seen by transmitted light, and which constitute by far the most important class of objects for study with the higher powers, it is usual to employ reflected light; a mirror, plane or concave, being commonly used for this purpose. The earlier microscopists often used direct light, sometimes pointing their tubes to the sky, sometimes employing a lamp, as in the instrument of Phllip Bonnani, figured by Chevalier and by Quekett, in their Treatises on the Microscope. Both these authors mention the use of direct light, and give figures of the method of employing it; Chevalier representing a candle, and Quekett an Argand lamp, as the source of illumination. Many very delicate objects are said by the latter author to be seen to the greatest advantage by this kind of light. A late writer in Silliman's Journal recommends its use in instituting comparisons between different lenses. It was used by Mr. Spencer in the trial of instruments I have referred to, he holding in his hand a common lamp, with one wick picked down, behind the stage, while we examined various objects with the higher powers.

"The fact, that so simple a method of illumination proved sufficient to define very delicate tests, led me to make trial of direct light as a substitute for other methods. But none of the instruments made at present being well adapted for its employment, I was led to contrive the new model, which I now offer for the examination of the Academy, and a figure of which accompanies this communication. This instrument is constructed with particular reference to dispensing with all reflectors, but can be used with excellent effect with a prism, when the light of the sky cannot be otherwise conveniently reached, as at a window opening on a narrow street. The mirror, with its two reflecting surfaces, glass and quicksilver, is got rid of, and with it several sources of error and imperfection are removed.

"The points I kept in view in the construction of this instrument were these: a fixed horizontal position; to dispense with machinery as far as possible; to employ the cheapest material.

"Direct light requires a vertical stage; a vertical stage implies a horizontal tube, and permits the use of a horizontal support for all illuminating contrivances. The power of *gravity* is therefore substituted for the ordinary adjustments of the parts above and below the stage. It is an easy matter to arrange a service of plate in all positions and relations on a table, as it commonly stands, but not so if it is inclined at an angle of forty-five degrees, or placed vertically. In this model every thing is kept in its place by gravity, except the object, which is very easily supported and adjusted without any particular mechanism. The moment the *fixed* horizontal position is given up, the simplicity of the instrument is gone. Thus the second principle, dispensing with machinery, is carried out by adhering to the first. To fulfil the third condition, that of employing the cheapest materials, it was necessary to make use of various substances for the different parts of the instrument. A piece of leaden pipe was fitted to hold the eye-glass and objectives; the latter being adapted by the bayonet joint of Chevalier. Its weight was of advantage in keeping it in its place. The rest of the instrument was made of wood, except the tripod, which was of iron, and the lever, diaphragm, screw, and springs, which were of brass. All the details will be described in connection with the figure.

"The following considerations determined some of the principal dimensions. When a person sits before a common table, the eye, when directed straight forward, is about eighteen or nineteen inches above it. This determines the height of the eye-piece and tube. To bring the hands to the height of the eye, with the elbows resting, the elbows must be raised about three inches above the table. This determines the height of the platform on which the whole rests. Eighteen inches will give width enough for the separation of the elbows. The tube being about eight inches long, which is a common length for microscopic bodies, the pieces on which it rests may be each of them an inch shorter. The common length of the English glass slides being three inches, the stage must be five inches wide, to admit of their moving about freely. From these dimensions several of the others are naturally derived.



On looking at the woodcut, it will be seen that the whole instrument is supported on an oblong square platform, the dimensions of which are 18 × 10 × 3. On this is placed a revolving disk, eight inches in diameter, fitting upon a pin in the centre of the frame. A tripod, the legs of which are screwed to this disk, rises from it; the two together giving a height of twelve inches from the top of the platform. The upper portion of this tripod is a flat ring, four inches in diameter. To this is screwed an oblong square of wood, seven inches in length by four in breadth and one and a half in thickness, which we may call the *bed*. In the middle of this *bed* is an angular groove, to which a lining of thick tinfoil is accurately pasted or glued. In this angular groove slides a piece of pine of the same length, with a rounded groove on its upper surface, carrying the tube, and which may be called the *cradle*. Its width is an inch and a half, and its upper surface one inch above that of the piece on which it rests. The stage is five inches broad by four in height and one fourth of an inch thick, secured firmly to the end of the *bed*. A round hole in its centre, three fourths of an inch in diameter, is centred with the end of the tube, and bevelled half an inch outward on the side toward the light, to allow greater obliquity of illumination. The shelf supporting the lamp is five inches square, and is supported by two stout pins received in two holes passing through the lower part of the stage into the end of the *bed*, so as to be easily removed for packing. A strong wire, two inches and a half long, is soldered to the middle of each side of the tube at right angles. By these wires the tube is slid backward and forward in the *cradle*, forming the *coarse adjustment*. A brass spiral spring is fastened in the anterior end of the groove in the *bed*. The short arm of the lever, (the long arm of which, seen in the woodcut, is moved by the screw below,) passing through a hole in the middle of the *bed* into a notch in the under part of the *cradle*, presses the cradle against the spiral spring. The whole length of the lever is twelve inches, that of the short arm three fourths of an inch, giving a ratio of one to fifteen in the two arms. The screw, which plays in a brass nut, has sixteen threads to the inch, so that one revolution moves the cradle and tube one two-hundred-and-fortieth of an inch. This is the *fine adjustment*. The head of the screw, two inches in diameter, is not milled, but scalloped, so that the forefinger lies easily in the hollows, and turns it either way. The stage being an inch wider than the bed, gives room on each side for the attachment of a flat brass spring, serving to hold the object-plate against the stage, at the same time permitting it to be moved freely in every direction. The object-plate itself is of brass, *eight inches long* by an inch and three quarters wide, with a hole three fourths of an inch in diameter in its centre, and below the hole a ledge two inches long, with two small springs to hold the glass slide on which the object is placed. The diaphragm is three inches in diameter, and is let into the stage, so as to be close behind the object-plate without touching it.

" The lamp is of an oblong square form, three inches in length, one and a half in width, one in depth, and fits snugly in a square box, with two wires, each three inches long, projecting from its extremities. The wick-tube, which is made small, to insure a bright flame, is close to the edge at the middle of one side; opposite to it is a slide, running up and down, and receiving an objective, by means of the common bayonet joint, to be used as an achromatic condenser. If the lamp flickers, it is guarded by a piece of tin four inches in height, bent to form three fourths of a circle three inches in diameter, and blackened on the inside. Two bent pieces of wire, driven into the end of the *bed* next the observer, serve to hold a hood or shade made of four pieces of thin board covered with black velvet, the top and sides turning down so as to shut out the light, the central piece cut in such a way as not to touch the tube or the cradle, which is its principal difference from that of Mr. Lister, as described by Quekett.

" To use the instrument, the elbows are rested on the platform, when all the preliminary arrangements are found close to the hands. The coarse adjustment is made, the object brought into position, the light arranged, with a precision that no machinery can surpass, because both the arms and hands are perfectly steadied. If the diaphragm is wanted, it may be easily reached with the fingers. Lastly, the fine adjustment is made by dropping one hand to the screw, and twirling its head back or forward with a single finger. If achromatic light is wanted, it is always ready; it is only necessary to turn the lamp half round, and bring the objective so as to illuminate the object to the best advantage. The intensity and obliquity both of common and achromatic light are variable to any extent with the same facility, by moving the lamp back and forward, or from side to side. None of the ordinary arrangements of microscopes admit of using *oblique* achromatic light efficiently and conveniently, if they allow it at all.

" If it is required to use this microscope by daylight, a small prism is placed directly before the hole in the stage, or the achromatic condenser, and turned until the proper illumination is obtained. To make the light oblique, the disk carrying the tripod is revolved on the platform.

" The following explanations will account for some of the arrangements, the reasons for which are not obvious at first sight. It is very difficult to make wood slide on wood without adhesion and consequent jerking. After many unsuccessful experiments, I found white-pine would run smoothly over a surface covered with tinfoil. The unusual length of the object-plate renders it much more manageable than the ordinary ones. The arrangement of the lever not only gives extreme accuracy and delicacy to the fine adjustment, but, the screw being independent of the rest of the instrument, the focus does not change when the hand is lifted from it, as it does in many microscopes. The wick-tube of the lamp is so placed that it can be brought close to the object, and is at the same time at such a distance from the achromatic condenser as to give light enough without heating it to any extent which might injure the glasses. The wires by which the tube is moved are a little above the level of the cradle, so as to admit of a slight rocking motion of the tube. The delicacy of the coarse adjustment is such, that the use of the fine adjustment may very often be dispensed with.

" This instrument cost between three and four dollars. I have been so well pleased with its performance, that I have ordered one to be made of brass and iron, with a hollow pillar instead of the tripod, with several modifications, but the same general arrangements. Such an instrument may cost about ten dollars, and would offer some advantages over a carefully constructed one of the cheaper materials, which, however, would do good service. I hope to have the opportunity of showing a more nicely executed instrument, of the same general form with this, at a future meeting of the Academy, and if it meets the approbation of microscopists, I shall request a competent workman to make them at the lowest rate he can afford, for those who are disposed to try a new and somewhat peculiar piece of mechanism.

" Many will at first object to the vertical stage, in the belief that fluids cannot be conveniently examined in the position this requires. I believe this objection is of little importance. Capillary attraction, which holds mercury suspended in a fragment of thermometer-tube, is surely enough to support any watery fluid and its contents between two plates of glass, if the film of fluid is thin enough. Currents there will often be, and currents there constantly are on a perfectly horizontal stage, unless various precautions are taken, which I shall not here stop to indicate. I have found no practical difficulty in examining any fluid I have tried, with its contents, whatever they might be. At the same time, neither this nor any other bulky instrument can be a substitute for a simple, portable, vertical instrument, with a horizontal stage, and mirror below it, to be employed with the *low powers*. It is an *adjunct* to it, performing all the difficult tasks which the small " comet-seeker " indicates and leaves unfinished. The new instrument *can* be employed with the lowest powers; most conveniently by using a secondary stage, consisting of a piece of sheet brass bent at right angles, and carrying two springs on its outer vertical surface to hold the object-plate; this secondary stage being placed on the lamp-shelf. But every microscopist requires a portable instrument which will be sufficient for all powers below the one-fourth inch objective or its equivalent. For twenty dollars or a little more, he can get such an instrument with two eye-glasses and two objectives. Let him add twelve dollars to this, and he can obtain, in addition, the highest objective of the French makers. With the addition of an instrument like that I have shown, he will have at his command a sufficiently complete series of powers, and the means of employing common and achromatic light in every degree of intensity and obliquity, with a brilliancy of effect and a convenience in application which I will venture to compare with those of much more costly instruments. If he can obtain the more perfect and expensive objectives of Mr. Spencer or the best London makers, he will be able to bring out all their powers, and need not fear to subject them to the trial of defining the most difficult test objects."

Professor Horsford made some additional remarks on the subject of the late explosion of burning-fluid at Salem. On further consideration, he was of opinion that the ascent of heated air above the stove would cause currents of air to descend by the sides of the pantry, and flow towards the stove; and that the vapor of burning-fluid would be thus carried towards the fire, and ignition consequently ensue. He also offered an explanation of several other cases of explosion of burning-fluid to which he referred.